In the claims:

Cancel claims 10 and 20.

Amend claims 3-9, 13-19, 47, 49 and 51 of remaining claims 1-9, 11-19 and 21-52.

1. (Previously Presented) In a magnetic read head having an air bearing surface (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense circuitry for detecting changes in electrical resistance within the sensor, the sensor comprising:

a MTJ stack with an active region disposed at the ABS and having oppositely facing first and second sides each disposed generally orthogonally to the ABS, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region and having first and second free layer extensions which extend in opposite directions from the first and second sides respectively;

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region;

the AFM, pinned, free and tunnel junction layers having parallel surfaces which extend between the first and second sides and are orthogonal with respect to the ABS; and

the first and second free layer extensions having first and second top surfaces which are parallel with respect to the parallel surfaces of the AFM, pinned, free and tunnel junction layers;

first and second longitudinal bias layers formed on and in contact with the first and second top surfaces of the free layer extensions outside of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field.

2. (Previously Presented) The sensor of claim 1 further comprising:

an insulating layer of electrically nonconductive material formed on and in contact with the free layer extensions outside of the active region and in abutting contact with the first and second sides of the active region.

3. (Currently Amended) The sensor of claim 2 wherein the first and second longitudinal bias ~~layer is~~ layers are disposed without contacting the active region.

4. (Currently Amended) The sensor of claim 3 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise a hard magnetic (HM) material.

5. (Currently Amended) The sensor of claim 3 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise an AFM material.

6. (Currently Amended) The sensor of claim 1 wherein the first and second longitudinal bias ~~layer is~~ layers are disposed without contacting the active region.

7. (Currently Amended) The sensor of claim 6 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise a HM material.

8. (Currently Amended) The sensor of claim 6 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise an AFM material.

9. (Currently Amended) The sensor of claim 1 further comprising:

the first and second longitudinal bias ~~layer comprises~~ layers comprising an electrically nonconductive AFM material disposed outside of the active region and in abutting contact with the two opposite sides of the active region.

10. (Cancelled)

11. (Previously Presented) A direct access storage device (DASD) comprising:

a magnetic recording disk having at least one surface for storing magnetically recorded data;

a magnetic read head having an air bearing surface (ABS) disposed for reading the data from the magnetic recording disk surface;

in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:

a MTJ stack with an active region disposed at the ABS and having oppositely facing first and second sides each disposed generally orthogonally to the ABS, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region and having first and second free layer extensions which extend in opposite directions from the first and second sides respectively;

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region;

the AFM, pinned, free and tunnel junction layers having parallel surfaces which extend between the first and second sides and are orthogonal with respect to the ABS; and

the first and second free layer extensions having first and second top surfaces which are parallel with respect to the parallel surfaces of the AFM, pinned, free and tunnel junction layers;

first and second longitudinal bias layers formed on and in contact with the first and second top surfaces of the free layer extensions outside of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field;

an actuator for moving the magnetic read head across the magnetic recording disk surface to access the data stored thereon; and

a data channel having sense circuitry coupled electrically to the MTJ sensor for detecting changes in resistance of the MTJ sensor caused by rotation of the magnetic moment of the free ferromagnetic layer relative to the fixed magnetic moment of the pinned layer responsive to magnetic fields representing the data stored on the magnetic recording disk surface.

12. (Previously Presented) The DASD of claim 11 further comprising:

an insulating layer of electrically nonconductive material formed on and in contact with the free layer outside of the active region and in abutting contact with the first and second opposite sides of the active region.

13. (Currently Amended) The DASD of claim 12 wherein the first and second longitudinal bias ~~layer is~~ layers are disposed without contacting the active region.

14. (Currently Amended) The DASD of claim 13 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise a hard magnetic (HM) material.

15. (Currently Amended) The DASD of claim 13 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise an AFM material.

16. (Currently Amended) The DASD of claim 11 wherein the first and second longitudinal bias ~~layer is~~ layers are disposed without contacting the active region..

17. (Currently Amended) The DASD of claim 16 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise a HM material.

18. (Currently Amended) The DASD of claim 16 wherein the first and second longitudinal bias ~~layer comprises~~ layers comprise an AFM material.

19. (Currently Amended) The DASD of claim 11 further comprising:

the first and second longitudinal bias ~~layer comprises~~ layers comprising an electrically nonconductive AFM material disposed outside of the active region and in abutting contact with the two opposite sides of the active region.

20. (Cancelled)

21.- 46. (Withdrawn)

47. (Currently Amended) A magnetic tunnel junction sensor, which has an air bearing surface (ABS), comprising:

a ferromagnetic pinned layer having a magnetic moment;

an antiferromagnetic (AFM) pinning layer exchange coupled to the pinned layer for pinning the magnetic moment of the pinned layer perpendicular to the ABS;

a ferromagnetic free layer having a magnetic moment parallel to the ABS;

a nonconductive and nonmagnetic spacer layer located between the free and pinned layers;

each of the AFM, pinned, spacer and free layers having first and second side surfaces which are orthogonal with respect to the ABS with the first side surfaces of the AFM, ~~pinned~~ pinned, spacer and free layers being contiguous and the second side surfaces of the AFM, pinned, spacer and free layers being contiguous;

each of the AFM, pinned, spacer and free layers having major thin film surfaces which extend between the first and second side surfaces, are orthogonal with respect to the ABS and are parallel with respect to one another;

the free layer having laterally extending first and second side extensions which extend in opposite directions from the first and second side surfaces respectively of the free layer with each of the first and second side extensions having a top surface which is orthogonal with respect to the ABS and parallel with respect to said major thin film surfaces;

first and second longitudinal bias layers interfacing the top surfaces of the first and second side extensions and spaced from the first and second side surfaces respectively of the free layer so as to leave first and second top surface portions respectively between the first and second longitudinal bias layers and the first and second side surfaces respectively of the free layer which are not interfaced by the first and second longitudinal bias layers; and

nonconductive and nonmagnetic first and second insulation layers interfacing the first and second side surfaces respectively of the AFM, pinned, spacer and free layers, the first and second top surface portions respectively and the first and second longitudinal bias layers respectively.

48. (Previously Presented) The sensor as claimed in claim 47 wherein the first and second longitudinal bias layers are composed of a hard magnetic material.

49. (Currently Amended) A magnetic read head, which has an air bearing surface (ABS), comprising:

first and second lead layers;

a magnetic tunnel junction (MTJ) sensor located between and in electrical contact with the first and second lead layers;

the MTJ sensor comprising:

a ferromagnetic pinned layer having a magnetic moment;

an antiferromagnetic (AFM) pinning layer exchange coupled to the pinned layer for pinning the magnetic moment of the pinned layer perpendicular to the ABS;

a ferromagnetic free layer having a magnetic moment parallel to the ABS;

a nonconductive and nonmagnetic spacer layer located between the free and pinned layers;

each of the AFM, pinned, spacer and free layers having first and second side surfaces which are orthogonal with respect to the ABS with the first side surfaces of the AFM, ~~pinned~~ pinned, spacer and free layers being contiguous and the second side surfaces of the AFM, pinned, spacer and free layers being contiguous; and

each of the AFM, pinned, spacer and free layers having major thin film surfaces which extend between the first and second side surfaces, are orthogonal with respect to the ABS and are parallel with respect to one another;

the free layer having first and second side extensions which extend beyond said first and second side surfaces with each of the first and second side extensions having a top surface;

first and second longitudinal bias layers interfacing the top surfaces of the first and second side extensions and spaced from the first and second side surfaces respectively of the free layer so as to leave first and second top surface portions respectively between the first and second longitudinal bias layers and the first and second side surfaces respectively of the free layer which are not interfaced by the first and second longitudinal bias layers; and

nonconductive and nonmagnetic first and second insulation layers interfacing the first and second side surfaces respectively of the AFM, pinned, spacer and free layers, the first and second top surface portions respectively and the first and second longitudinal bias layers respectively.

50. (Previously Presented) The magnetic head as claimed in claim 49 wherein the first and second longitudinal bias layers are composed of a hard magnetic material.

51. (Currently Amended) A direct access storage device (DASD) comprising:

a magnetic recording disk having at least one surface for storing magnetically recorded data;

a magnetic read head having an air bearing surface (ABS) disposed for reading the data from the magnetic recording disk surface;

in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:

a ferromagnetic pinned layer having a magnetic moment;

an antiferromagnetic (AFM) pinning layer exchange coupled to the pinned layer for pinning the magnetic moment of the pinned layer perpendicular to the ABS;

a ferromagnetic free layer having a magnetic moment parallel to the ABS;

a nonconductive and nonmagnetic spacer layer located between the free and pinned layers;

each of the AFM, pinned, spacer and free layers having first and second side surfaces which are orthogonal with respect to the ABS with the first side surfaces of the AFM, ~~pinned~~ pinned, spacer and free layers being contiguous and the second side surfaces of the AFM, pinned, spacer and free layers being contiguous;

each of the AFM, pinned, spacer and free layers having major thin film surfaces which extend between the first and second side surfaces, are orthogonal with respect to the ABS and are parallel with respect to one another; and

the free layer having laterally extending first and second side extensions which extend in opposite directions from the first and second side surfaces respectively of the free layer with each of the first and second side extensions having a top surface which is orthogonal with respect to the ABS and parallel with respect to said major thin film surfaces;

first and second longitudinal bias layers interfacing the top surfaces of the first and second side extensions and spaced from the first and second side surfaces respectively of the free layer so as to leave first and second top surface portions respectively between the first and second longitudinal bias layers and the first and second side surfaces respectively of the free layer which are not interfaced by the first and second longitudinal bias layers;

nonconductive and nonmagnetic first and second insulation layers interfacing the first and second side surfaces respectively of the AFM, pinned, spacer and free layers, the first and second top surface portions respectively and the first and second longitudinal bias layers respectively;

an actuator for moving the magnetic read head across the magnetic recording disk surface to access the data stored thereon; and

a data channel having sense circuitry coupled electrically to the MTJ sensor for detecting changes in resistance of the MTJ sensor caused by rotation of the magnetic moment of the free ferromagnetic layer relative to the fixed magnetic moment of the pinned layer responsive to magnetic fields representing the data stored on the ~~magnet~~ magnetic recording disk surface.

52. (Previously Presented) The sensor as claimed in claim 51 wherein the first and second longitudinal bias layers are composed of a hard magnetic material.